**Mission: Something From Nothing**

**Overview**

* Project Description: Imagination & creativity are the most powerful factors we have in American education. Part of the everyday process in the working world is the ability to rapidly visualize or prototype items, whether they are vehicles, objects, buildings, etc. This project will be to show students how to literally make something that comes directly from their imagination. The outside subject matter expert in this case will be an engineer, inventor or design specialist who will be a resource for the students to call upon.

**End Product/Goal:**

Students will conclude this project with an understanding of how rapid prototyping works. The “winning” design will be made using a 3D printer and given to the team that designed it.

**Suggested Time Frame:**

|  |  |
| --- | --- |
| Session 1 | Introduction |
| Session 2 | Building design - Architecture |
| Session 3 | Vehicle design |
| Session 4 | Practical design – Pencil holder |
| Session 5 | Modular design – How parts fit together (subassemblies) |

**Materials/Prep:**

Session 1:

* Video of rapid prototyping
* Lots of paper and pencils

Sessions 2, 3, 4:

* Mission Folder
* Papers/pencils
* CupCake CNC or equivalent
* Computer
  + Google Sketch-up
  + Rep-rep
* ABS plastic or equivalent
* Power sources for computer and 3D printer

Session 5

* Multiple Mission Folders
* Papers/pencils
* CupCake CNC or equivalent
* Computer
  + Google Sketch-up
  + Rep-rep
* ABS plastic or equivalent
* Power sources for computer and 3D printer

**Session 1 - Introduction**

* Introduction of the specialist for the day
* Video about rapid prototyping
* Discussion of what a building is and how one is put together
* Discussion of the design process in automobiles
* Discussion of how everyday objects in the room are used by kids & how they would fix them or change them

**Session 2 – Building design**

* Introduction of the specialist for the day
* Review what a building is. (2 minutes)
* Open folders and read about mission (5 minutes)
  + The school needs to be redesigned – how should it be organized and what shape should it look like?
* Design a new building and/or layout (10 minutes)
* Specialist will review and pick one for prototyping – machine will spool up
* During production, teacher and specialist will discuss positive and negative features of the varied teams’ designs.

**Session 3 – Vehicle design**

* Introduction of the specialist for the day
* Review why vehicles are designed the way they are. (2 minutes)
* Open folders and read about mission (5 minutes)
  + School buses need to be redesigned. How would you guys change it to better fit entry/exit and comfort?
* Design a new bus and/or layout (10 minutes)
* Specialist will review and pick one for prototyping – machine will spool up
* During production, teacher and specialist will discuss positive and negative features of the varied teams’ designs.

**Session 4 – Practical design**

* Introduction of the specialist for the day
* Review common objects and how they are made. (2 minutes)
* Open folders and read about mission (5 minutes)
  + The President keeps loosing pencils off the Oval Office desk. He’d like a way to hold a pencil. How would you create this?
* Design a new pencil holder and/or layout (10 minutes)
* Specialist will review and pick one for prototyping – machine will spool up
* During production, teacher and specialist will discuss positive and negative features of the varied teams’ designs.

**Session 5– Modular design**

* Introduction of the specialist for the day
* Play with pre-created modular pieces to see how things fit together (4 minutes) – Legos, Lincoln logs,etc.
* Open folders and read about mission (3 minutes)
  + Klaatu, a giant space alien has become an ambassador to Earth, but the only desks we have are too short for Klaatu to sit at. We need to raise the desk 12”, but we need to design small pieces that fit together to raise the desk at 4 corners.
* Design a new modular piece and/or layout (5 minutes)
* Specialist will review and pick one for prototyping – machine will spool up (need extra time to make multiple pieces.)
* During production, teacher and specialist will discuss positive and negative features of the varied teams’ designs.

**Optional Extension Activities:**

* Videos or site visits of manufacturing facilities
* Computer Assisted Design – drawing programs
  + Students take handwritten drawings and replicate (as best they can) using Google SketchUp
* Materials science – wood, metal, plastic, etc
  + Students can touch, examine test different materials
  + Discussion can be had with them to see intuitive grasp of why some materials are better than others for specific purposes.